

Project 25 Compliance Assessment Program

Summary Test Report BK Radio KNG-M150 Series Subscribers STR-RELM-KNG-M150-01052016

Device Under Test Description: Mobile Subscriber	
Manufacturer	RELM Wireless Corporation
Manufacturer Contact	Jim Holthaus 402-896-6406
Product Name	KNG-M150 VHF Mobile Subscriber Radio
Frequency Band	VHF
Installed Options	Encryption, Trunking
Installed Vocoder	Enhanced Dual Rate with System Improvements

Test Description
P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.1 – Project 25 Phase 1 Common Air Interface Conventional Subscriber Unit Performance.
P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Performance.
P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.3.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Interoperability.

Informative References	
Date	Title
March 2010	P25-CAB-CAI_TEST_REQ

Other Devices Tested with RELM KNG-M150		
Manufacturer	Product Name and Definition	Installed Options
Motorola Solutions	ASTRO 25 System	System Release 7.15
Airbus DS Communications	Cassidian P25 Core Network	EADS P25V11_06 E22
Tait	TaitNet TN9400	System Release TN9400 V1.40
Harris	P25 Trunked Infrastructure	System Release PR9B
Codan	Daniels	System Release 1.1.0.9
EF Johnson	Trunking	System Release 3.2-RC4

Laboratory Information	
P25 CAP Laboratory Code	Compliance Testing, LLC P25CAP081011-Motorola
Date(s) of Test	28 August 2015
Date of Issue	8 September 2015
P25 CAP Laboratory Code	Compliance Testing, LLC P25CAP081011-Daniels
Date(s) of Test	20-21 February 2012
Date of Issue	21 February 2012
P25 CAP Laboratory Code	TIMCO Engineering, Inc. P25CAP081016
Date(s) of Test	8 February 2011 – 9 March 2011
Date of Issue	19 August 2011
P25 CAP Laboratory Code	Harris Corporation P25CAP081017
Date(s) of Test	19 April 2011
Date of Issue	29 April 2011
P25 CAP Laboratory Code	EF Johnson Technologies P25CAP081010
Date(s) of Test	20 August 2010
Date of Issue	23 August 2010

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Performance Test Cases and Results

P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.1 – Project 25 Phase 1 Common Air Interface Conventional Subscriber Unit Performance		DTR:TIMCO081016 KNG-M150	
Performance - Conventional Receiver Tests KNG-M150 VHF (136-174 MHZ)			
Test Case	Description	Requirement	Results
2.1.4	Reference Sensitivity	≤ -116 dBm	P1
2.1.5	Faded Reference Sensitivity	≤ -108 dBm	P2
2.1.6	Signal Delay Spread Capability	≥ 50 μs	P3
2.1.7	Adjacent Channel Rejection	≥ 60 dB	P4
2.1.8	Co-Channel Rejection	≤ 9 dB	P
2.1.9	Spurious Response Rejection	≥ 80 dB	P
2.1.10	Intermodulation Rejection	≥ 75 dB	P
2.1.11	Signal Displacement Bandwidth	≥ 1000 Hz	P
2.1.17	Late Entry Unsquelch Delay		
	No Talk Group or Encryption	≤ 125 mS	P
	Talk Group Only	≤ 370 mS	P
	Encryption Only	≤ 370 mS	P
	Both (On Clear or Encrypted Channel)	≤ 460 mS	P
2.1.18	Receiver Throughput Delay	≤ 125 mS	P

P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.1 – Project 25 Phase 1 Common Air Interface Conventional Subscriber Unit Performance		DTR:TIMCO081016 KNG-M150	
Performance - Conventional Transmitter Tests KNG-M150 VHF (136-174 MHz)			
Test Case	Description	Requirement	Results
2.2.8	Unwanted Emissions: Adjacent Channel Power Ratio	≥67 dB	P
2.2.12	Transmitter Power Attack Time	≤50 mS	P
	Encoder Attack Time	≤100 mS	P
2.2.14	Transmitter Throughput Delay	≤ 125 mS	P
2.2.15	Frequency Deviation for C4FM		
	High Level Signal Deviation	2544 ≤ f _{dev} ≤ 3111 Hz	P
	Low Level Signal Deviation	848 ≤ f _{dev} ≤ 1037 Hz	P
2.2.16	Modulation Fidelity	≤ 5%	P
2.2.18	Transient Frequency Behavior		
	Time Interval t ₁ = 5.0 mS	Δf ≤ 12.5 kHz	P
	Time Interval t ₂ = 20.0 mS	Δf ≤ 6.25 kHz	P
	Time Interval t ₃ = 5.0 mS	Δf ≤ 12.5 kHz	P

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P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Performance		DTR-TIMCO081016 KNG-M150	
Performance - Trunked Receiver Tests KNG-M150 VHF (136-174 MHz)			
Test Case	Description	Requirement	Results
2.1.4	Reference Sensitivity	≤ -116 dBm	P1
2.1.5	Faded Reference Sensitivity	≤ -108 dBm	P2
2.1.6	Signal Delay Spread Capability	≥ 50 μs	P3
2.1.7	Adjacent Channel Rejection	≥ 60 dB	P4
2.1.8	Co-Channel Rejection	≤ 9 dB	P
2.1.9	Spurious Response Rejection	≥ 80 dB	P
2.1.10	Intermodulation Rejection	≥ 75 dB	P
2.1.11	Signal Displacement Bandwidth	≥ 1000 Hz	P

P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Performance		DTR-TIMCO081016 KNG-M150	
Performance - Trunked Transmitter Tests KNG-M150 VHF (136-174 MHz)			
Test Case	Description	Requirement	Results
2.2.8	Unwanted Emissions: Adjacent Channel Power Ratio	≥67 dB	P
2.2.12	Transmitter Power Attack Time	≤50 mS	P
	Encoder Attack Time	≤100 mS	P
2.2.14	Transmitter Throughput Delay	≤ 125 mS	P
2.2.15	Frequency Deviation for C4FM		
	High Level Signal Deviation	$2544 \leq f_{dev} \leq 3111$ Hz	P
	Low Level Signal Deviation	$848 \leq f_{dev} \leq 1037$ Hz	P
2.2.16	Modulation Fidelity	≤ 5%	P
2.2.18	Transient Frequency Behavior		
	Time Interval t ₁ = 5.0 mS	$ \Delta f \leq 12.5$ kHz	P
	Time Interval t ₂ = 20.0 mS	$ \Delta f \leq 6.25$ kHz	P
	Time Interval t ₃ = 5.0 mS	$ \Delta f \leq 12.5$ kHz	P

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P25-CAB-CAI_TEST_REQ – March 2010, Section 2.1.1.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Performance		DTR-TIMCO081016 KNG-M150	
Performance - Trunked Subscriber Tests KNG-M150 VHF (136-174 MHz)			
Test Case	Description	Requirement	Results
2.3.1	Trunking Control Channel Slot Times (45 mS Slot) Encode Attack Time RF Power Attack Time RF Power Turn Off Time	2.00 mS ≤ t ≤ 11.65 mS 0.00 mS ≤ t ≤ 11.65 mS ≤ 1.57 mS	P P P
2.3.2	Trunking Request Time	≤ 167 mS	P
2.3.3	Trunking Voice Access Time	≤ 1000 mS	P5
2.3.5	Transmitter Time to Key on a Traffic Channel RF TX time to Key – Working Channel Encoder Transmit Time	≤150.0 mS ≤150.0 mS	P P

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P25-CAB-CAI_TEST_REQ_March 2010, Section 2.1.3.2 – Project 25 Phase 1 Common Air Interface Trunked Subscriber Unit Interoperability		DTR-P25CAP081011 Motorola	DTR-P25CAP081010-10082301-RELM	DTR-P25CAP081017-1110419R01	DTR-TIMCO081016 Tait/TN9400/RELM	DTR-TIMCO081016 Tait/Airbus/RELM	DTR-P25CAP081011 Daniels
RELM Model Class KNG Series Subscriber Radios		Motorola ASTRO 25 System Release 7.15	EFJohnson Technologies System Release 3.2-RC4	Harris P25 Trunked Infrastructure	Tait TN-9400	Airbus DSC P25 VESTA Radio Infrastructure	Daniels P25 Trunked Radio System
Test Case	Description	Results					
2.2.1	Full Registration						
2.2.1.4.1	Test Case 1 - Valid Registration						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.1.4.2	Test Case 2 – Denied or Refused Registration						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.1.4.3	Test Case 3 – Unverified Registration						
	Home Configuration	P	P	P	P	P	N5
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.2	Group Voice Call						
2.2.2.4.1	Test Case 1 – Group Call Granted						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.2.4.2	Test Case 2 – Group Call Denied						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.2.4.3	Test Case 3 – Group Call Request Queued						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3	Unit-to-Unit Voice Call						
2.2.3.4.1	Test Case 1 Unit-to-Unit Call with Target Availability Check						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2

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RELM Model Class KNG Series Subscriber Radios		Motorola ASTRO 25 System Release 7.15	EFJohnson Technologies System Release 3.2-RC4	Harris P25 Trunked Infrastructure	Tait TN-9400	Airbus DSC P25 VESTA Radio Infrastructure	Daniels P25 Trunked Radio System
Test Case	Description	Results					
2.2.3.4.2	Test Case 2 Unit-to-Unit Call with Target Availability Check Denied by Target						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3.4.3	Test Case 3 – Unit-to-Unit Call queued with Target Availability Check - Traffic Channel Assignment After Target Availability Check.						
	Home Configuration	P	P	P	N/A1	N/A1	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3.4.4	Test Case 4 – Unit-to-Unit Call without Target Availability Check - Traffic Channel Assignment Before Target Availability Check						
	Home Configuration	N/A2	N/A2	P	P	P	N/A2
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3.4.5	Test Case 5 – Unit-to-Unit Call without Target Availability Check						
	Home Configuration	N3	N3	P	N3	N3	N3
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3.4.6	Test Case 6 – Unit-to-Unit Call Queued without Target Availability Check						
	Home Configuration	N4	N4	P	N4	N4	N4
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.3.4.7	Test Case 7 – Unit-to-Unit Call Denied						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.4	Broadcast Voice Call						
2.2.4.4.1	Test Case 1 – Broadcast voice call						

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RELM Model Class KNG Series Subscriber Radios		Motorola ASTRO 25 System Release 7.15	EFJohnson Technologies System Release 3.2-RC4	Harris P25 Trunked Infrastructure	Tait TN-9400	Airbus DSC P25 VESTA Radio Infrastructure	Daniels P25 Trunked Radio System
Test Case	Description	Results					
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.5	Affiliation						
2.2.5.4.1	Test Case 1 – Radio Permitted to Affiliate with New Group						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.5.4.2	Test Case 2 – Radio Denied Affiliation to New Group						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.6	Announcement Group Call						
2.2.6.4.1	Test Case 1 – Collection of talk groups receive call						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.7	Emergency Alarm						
2.2.7.4.1	Test Case 1 – Emergency Alarm						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.8	Emergency Group Call						
2.2.8.4.1	Test Case 1 – Emergency call						
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.10	Encryption						
2.2.10.4.1	Test Case 1 – Call Privacy for Encrypted Call						

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RELM Model Class KNG Series Subscriber Radios		Motorola ASTRO 25 System Release 7.15	EFJohnson Technologies System Release 3.2-RC4	Harris P25 Trunked Infrastructure	Tait TN-9400	Airbus DSC P25 VESTA Radio Infrastructure	Daniels P25 Trunked Radio System
Test Case	Description	Results					
	Home Configuration	P	P	P	P	P	P
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2
2.2.11	Inter-Location Registration Area Roaming						
2.2.11.4.1	Test Case 1 – Idle radio						
	Home Configuration	P	P	P	P	P	N5
	Inter-System Roaming Configuration	N1	N1	N1	N1	N1	N1
	Inter-WACN Roaming Configuration	N2	N2	N2	N2	N2	N2

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Model Class: BK Radio KNG Series Subscriber	
Product Name, Definition and Unique ID	Model Number and Installed Options
KNG-P150 VHF Portable Release 1.2.1.1 thru 1.5.3.0	KNG-P150, KNG-P150T2, KNG2-P150, KNG2-P150T2 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P400 380-470 MHz Portable Release 1.2.1.1 thru 1.5.3.0	KNG-P400, KNG-P400T2, KNG2-P400, KNG2-P400T2 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P500 440-520 MHz Portable Release 1.2.1.1 thru 1.5.3.0	KNG-P500, KNG-P500T2, KNG2-P500, KNG2-P500T2 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-P800 700/800MHz Portable Release 1.2.1.1 thru 1.5.3.0	KNG-P800, KNG-P800T2, KNG2-P800, KNG2-P800T2 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M150 VHF Mobile Release 2.2.1.1 thru 2.5.3.0	KNG-M150, KNG-B150, KNG-TMR150 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M400 380-470 MHz Mobile Release 2.2.1.1 thru 2.5.3.0	KNG-M400, KNG-B400, KNG-TMR400 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M500 440-520 MHz Mobile Release 2.2.1.1 thru 2.5.3.0	KNG-M500, KNG-B500, KNG-TMR500 Options: Trunking (KZA0579) and Encryption (KZA0577)
KNG-M800 700/800MHz Mobile Release 2.2.1.1 thru 2.5.3.0	KNG-M800, KNG-B800, KNG-TMR800 Options: Trunking (KZA0579) and Encryption (KZA0577)

Test Case Result Definitions	
No Test Performed	N/A
Test Does Not Apply to the Test Object	N/A
Test Object Meets Requirements	P (Pass)
Test Object Does Not Meet Requirements	F (Fail)
Test Object is Not Conclusive	I (Inconclusive)
Comments	
N1: Infrastructure and Subscribers do not support Inter-System Roaming Configuration.	
N2: Infrastructure and Subscribers do not support Inter-WACN Roaming Configurations.	
N/A1 Test case 2.2.3.4.3 is not applicable for Tait and Airbus Infrastructure; see results of test case 2.2.3.4.4.	
N/A2 Test case 2.2.3.4.4 is not applicable for Motorola, EFJohnson and Daniels Infrastructure; see results of test case 2.2.3.4.3.	
N3 Test Case 2.2.3.4.5 is not supported on Motorola, EFJohnson, Tait, Airbus and Daniels Infrastructure.	
N4 Test Case 2.2.3.4.6 is not supported on Motorola, EFJohnson, Tait, Airbus and Daniels Infrastructure.	
N5 Test Case 2.2.11.4.1 is not supported on Daniels Infrastructure.	
P1: RELM subscriber passes Reference Sensitivity (≤ -116 dBm) specification for C4FM (Non-Simulcast) and Simulcast modulations.	
P2: RELM subscriber passes Faded Reference Sensitivity (≤ -108 dBm) specification for C4FM (Non-Simulcast) and Simulcast modulations.	
P3: RELM subscriber passes Signal Delay Spread Capability specification for C4FM (Non-Simulcast) (≥ 50 μ s) and Simulcast (≥ 80 μ s) modulations.	
P4: RELM subscriber passes Adjacent Channel Rejection (≥ 60 dB) specification for C4FM (Non-Simulcast) and Simulcast modulations.	
P5: Trunking Voice Access Time will vary dependent on actual system design and implementation.	

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OMB NO: 1640-0015

EXPIRATION DATE: 07/31/2015 New OMB Date: 04/30/2016 - KRT for DHS OIC

Burden Statement

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DHS FORM 10056 – June 2009